REMARKS

This is a response filed after a Pre-Appeal Brief Review conference regarding this application. There were no comments that were provided by the Panel, other than to "Proceed to Board of Patent Appeals and Interferences." Accordingly, Applicants repeat the comments to the Panel in this response, and incorporate the Pre-Appeal Brief Request for Review filed April 4, 2007 herein by reference.

Applicants have added new dependent claims 118-121, each of which depends from claim 1. Claim 118 recites that at least one crossed conductors is attached to a chemically patterned surface, where the surface comprises at least first and second portions which attract the at least one crossed conductors. Claim 119 recites that at least one of the first and second portions is defined by a self-assembled monolayer. Claim 120 recites that at least one of the first and second portions comprises a micro-phase separated block copolymer structure. Claim 121 recites that the nanoscopic wire is grown catalyst nanoparticles. Support for these amendments can be found in the specification, for example, on page 13, lines 17-page 14, line 25, or on page 16, lines 15-25. Accordingly, no new matter has been added.

Independent claims 122-150 supported by the specification have also been added.

Inadvertent typographical errors have been corrected in claims 56 and 57. In addition, claim 107 has been amended to provide proper antecedent basis.

No new matter has been added. Claims 1, 3, 5, 7-10, 13, 14, 16-18, 20-23, 56-59, 90-104, 107-112, and 114-148 are now pending for examination.

Rejections under 35 U.S.C. §103(a)

Claims 1, 3, 5, 7-10, 13, 14, 16-18, 20-23, 56-59, 90-104, 107-112, and 114-117 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Melzner, *et al.*, U.S. Patent No. 5,774,414 ("Melzner") and Brandes, *et al.*, U.S. Patent No. 6,445,006 ("Brandes").

To summarize the comments below, the Examiner has not provided a proper rationale to support a rejection under 35 U.S.C. §103(a) of the combination of Melzner and Brandes. The Examiner only makes conclusory statements that are unsupported by any findings. The Examiner must provide an articulate reason, with some rational underpinning, as to why one of ordinary skill

in the art would combine Canon with Fitch. See *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___ (2007), quoting *In re Kahn*, 441 F.3d 977 (Fed. Cir. 2006).

Specifically, the Examiner has repeatedly stated that the rationale for making the combination of Melzner and Brandes is to "capitalize on the semiconducting properties of carbon nanotubes." See, e.g., the Office Action of October 13, 2006, ¶3; the Office Action of February 21, 2006, ¶6; or the Office Action mailed July 26, 2005, ¶4; see also the Office Action mailed November 19, 2004, ¶10 (same rationale, but difference references). A statement "to capitalize on the semiconducting properties of carbon nanotubes" is vague and conclusory, and is not supported by any evidence of record. Without any supporting evidence, the statements by the Examiner alleging that Melzner could be modified in such a way as to "capitalize on the semiconducting properties of carbon nanotubes" is improper speculation on the part of the Examiner. The Examiner has not provided any incentive or justification, whether it be scientific, technical, economic, a market force, or otherwise, for one of ordinary skill in the art to combine Melzner with Brandes.

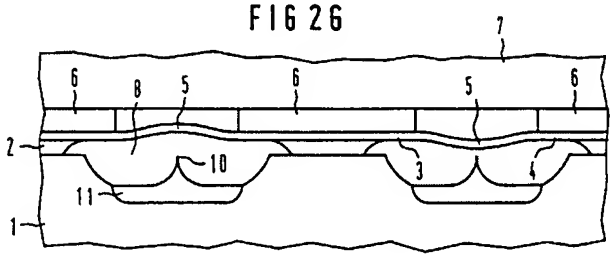
Moreover, the term "capitalize" is vague and general, and could mean any number of different things. For example, one of ordinary skill in the art, in attempting to "capitalize" on the semiconductor properties of carbon nanotube sensors, may be motivated to produce shorter carbon nanotubes or larger carbon nanotubes. Or, perhaps the person of ordinary skill in the art would look for ways to decrease the costs of manufacturing or selling such nanowires. The Examiner has provided no articulate reasons, beyond mere "capitalization," as to why a person of ordinary skill in the art, in reading Melzner (which does not even disclose or suggest a carbon nanotube), would modify Melzner in such a way as to incorporate the teachings of Brandes. Melzner is directed to a semiconductor memory device, while Brandes is directed to carbon-based nanotube sensors, and thus, Melzner and Brandes do not represent known variations of each other. There is no logical relationship between a memory device and a sensor, and there is no teaching in the art that a memory device is functionally equivalent to a sensor.

It appears that the Examiner has taken the phrase "to capitalize on the semiconducting properties of carbon nanotubes" from Brandes. See, col. 7, line 67 to col. 8, line 2. However, using *Melzner* as the primary reference, the Examiner cannot point to a statement in *Brandes* to provide the teaching, suggestion, or motivation to combine them. Such an approach is a classic hindsight

combination: (1) combine a first reference with a second reference, then (2) identify a statement in the second reference that justifies finding it in the first place. This approach is impermissible. Instead, the Examiner must point to a teaching, suggestion, or motivation in *Melzner*, not Brandes, to provide the justification for combining Melzner with Brandes.

Even if, *arguendo*, one of ordinary skill in the art is motivated to make the combination of Melzner with Brandes, it is not seen how this combination could even be physically formed. Accordingly, one of ordinary skill in the art would not have expected that the results of any combination of Melzner and Brandes would lead to a predictable, functional device. In Melzner, the relative positions of a series of diaphragms (circular discs) are used to establish a pattern of electrical connections to store data. The diaphragms are under internal compressive stresses such that they are always in a "concave up" or a "concave down" position. This is similar in concept to a toy bimetallic or "jumping" disk, which is made of two metals (e.g., brass and iron) that expand and contract at different rates: when heated (e.g., by holding it in one's hand), the disk is concave down, but when it cools (causing differential contraction of the disk), it snaps into its concave up shape, which can be used to propel it off of a table. The diaphragms of Melzner appear to operate under a similar principle. In one state, diaphragm 5 is in a "concave up" state and thereby contacts a "sharp point" 10 just below the diaphragm (see Fig. 2G, reproduced below, right diaphragm); in the other state, the diaphragm is in a "concave down" state and does not contact the "sharp point" (Fig. 2G, left diaphragm). The diaphragms can be flipped from one state to the other using, e.g., pneumatic forces (col. 2, lines 60-67), for example, by heating a gas with a laser to a few hundred degrees Celsius, to increase the pressure by one atmosphere (col. 3, lines 1-3).

FIG 2G



Brandes, on the other hand, is directed to the use of carbon nanotubes as sensors. Initially, it should be noted that the scale of the device in Brandes, which uses carbon nanotubes, are typically

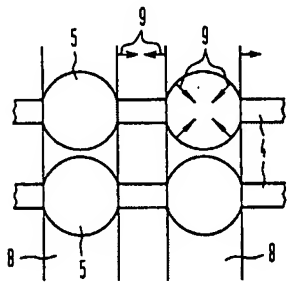
several orders of magnitude smaller than in Melzner, which does not disclose or suggest nanotubes. It is well-known that physical forces on the macroscale, and even on the microscale, do not readily translate to equivalent forces on the nanoscale. Accordingly, there is no reasonable expectation of success for combining Melzner and Brandes, and the sensor device of Brandes cannot be said to represent a known improvement or technique that could be predictably applied to the base memory device of Melzner in order to produce an improved memory device. To the contrary, when considering the nanoscale, different physical forces and processes will be involved. For instance, van der Waals forces can be quite substantial on the nanoscale, as taught in the instant application, but are miniscule on the microscale or macroscale and are thus ignored. One of ordinary skill in the art would have recognized that the device of Brandes is not applicable to the device of Melzner, due to these different physical forces and processes caused by such differences in length scale.

Moreover, it is not clear which component of Melzner would be substituted with a carbon nanotube of Brandes. As discussed above, the Examiner has stated that such a substitution could be made to "capitalize on the semiconducting properties of carbon nanotubes," but continues to provide no explanation as to what substitutions could be made (let alone why one of ordinary skill in the art would choose to make such a substitution), despite Applicants' repeated requests. See, e.g., the Request for Review filed April 4, 2007, page 4, the Response filed August 7, 2006, page 10, or the Response filed December 20, 2005, page 10. The combination of a memory device and a sensor is nonsensical, and the Examiner has not explained or even suggested that one of ordinary skill in the art would have recognized that the combination of a memory device and a sensor device would lead to a predictable outcome, nor has the Examiner identified a finite number of identified, predictable potential solutions where a component of a memory device could be replaced with a component of a sensor. The memory device of Melzner is a device that is useful for storing data, while the sensor of Brandes is directed to detecting mechanical motion. What would be stored, and what would be sensed? What would be substituted with what? Would the sensor elements themselves also store bits of memory? Would the memory elements of the memory device, used for storing bits of data, also be simultaneously used to determine when the memory device was moved? It is not at all clear how one of ordinary skill in the art could have substituted an element of Brandes for an element of Melzner, such that the substitution, or the results of the substitution, would have

been predictable. Applicants have repeatedly asked the Examiner to predict and explain what such a device would look like and how it would function, but the Examiner has still not provided such an explanation.

The device in Melzner comprises a circular diaphragm that is under compressive stress such that it is in a "concave up" or "concave down" shape. Fig. 2D (below) shows a top view of four such diaphragms, while Fig. 2G (reproduced above) shows a side profile:

FIG 2D



Additionally, a "sharp point" contacts the diaphragm when the diaphragm is "concave up."

It is not clear which of these components could be substituted with a carbon nanotube, and the Examiner has not pointed to any reference of record that shows that a substitution of a portion of the memory device with a carbon nanotube would have been predictable and known by one of ordinary skill in the art. For example, if the sharp point was substituted with a carbon nanotube, then the invention as recited in the Applicants' claims would not be met. If the diaphragm in Melzner were replaced with a carbon nanotube, it is not clear if such a carbon nanotube should be fixed at one end, or at both ends, or how the carbon nanotubes could be placed under compressive strength, as Melzner teaches, such that the carbon nanotubes would be bistable, or how one or more nanotubes could otherwise be made to move into different positions to achieve the objects of Melzner. If the carbon nanotubes were fixed at only one end, it is not seen how bistability could be maintained. In addition, if carbon nanotubes were used instead of a diaphragm, it is not clear how alignment of the nanotubes with the sharp point would be accomplished. Given the nanoscopic dimensions of the carbon nanotubes, precise alignment of the nanotube with the sharp point from the lower substrate would be required, as even a slight difference would cause the carbon nanotube to completely miss the sharp point, resulting in a nonfunctional device. In Melzner, precise alignment is unnecessary due to the circular shape of the diaphragm. If more than one carbon

nanotube were used in order to guarantee contact, it is not clear how all of the carbon nanotubes would each be fixed or manipulated such that the carbon nanotubes would all be "concave up" or "concave down," i.e., such that the sharp point on the lower substrate would receive one signal, and not multiple or inconsistent signals from the multiple carbon nanotubes. In addition, Applicants do not see where Melzner teaches or suggests that multiple components would be useful in order to guarantee contact. As noted, Melzner guarantees contact simply due to the circular shape of the diaphragm. If all of the components of Melzner were replaced with the carbon nanotubes of Brandes, then it is also not clear how the device would be made or used. Fig. 9B of Brandes is not helpful in regard; Applicants do not see how this figure, and its related description, is consistent with substitution in the bistable device of Melzner.

Thus, the Examiner has not indicated how Melzner and Brandes could actually be combined to form a workable device with a reasonable expectation of success. One of ordinary skill in the art could not have implemented the instant invention as claimed based on the teachings of Melzner and Brandes using ordinary skill. This rejection is therefore improper, as the Examiner must show a reasonable expectation of success that the combination can be formed. Such a combination would pose major difficulties, as discussed above, and thus, there would be no reasonable expectation of success of making their combination.

In addition, the Examiner refers to a section in Brandes that states that "the unique mechanical and electrical properties of carbon nanotubes enable a variety of novel electromechanical devices to be produced, when a suitable method of incorporating the carbon nanotube (microfiber) until the device is employed. The catalyst patterning and carbon nanotube growth process of U.S. Patent No. 5,872,422 provides a useful approach for accomplishing this result." Initially, this statement appears in Brandes, not Melzner, and the Examiner has not explained why one of ordinary skill in the art, in reviewing Melzner, would contemplate such a concept as disclosed in Brandes, if the person of ordinary skill in the art has not yet identified Brandes as a reference suitable for combination with Melzer. Moreover, this statement of Brandes is a vague and general statement that simply states that a variety of novel electromechanical devices can be produced. This statement says nothing about the type or structure of any such mechanical electrical devices, or what their functions would be. For example, this statement nowhere discloses

or suggests a memory device, a chemical sensor, or any other specific structure. The Patent Office is required to show a reasonable expectation of success in making the obviousness rejection. However, this paragraph does not give one of ordinary skill in the art a reasonable expectation of success. It is only a statement that a novel electromechanical device can be produced. Clearly, Brandes did not contemplate, and has no disclosure, as to how one would be able to produce a memory device.

In addition, the Applicants also present evidence of secondary considerations that further illustrate that the combination of Melzner and Brandes would not have rendered obvious the claimed invention. Specifically, the assignee of the instant application, Harvard University (full legal name: President and Fellows of Harvard College), has co-exclusively licensed the instant application to two different companies: Nanosys, Inc. (based in Palo Alto, California) and Nantero, Inc. (based in Woburn, Massachusetts). This evidence is presented in the form of an enclosed declaration under 37 C.F.R. §1.132, signed by Dr. Bob Benson, Director of Business Development at Harvard University, who is responsible for managing licensing of the instant patent application to Nanosys, Inc., and Nantero, Inc. The fact that the invention has been co-exclusively licensed to two companies, which each intend to commercialize various aspects of the present invention as claimed, shows that the inventions as claimed in the instant patent application enjoy commercial success.

Accordingly, for at least the above reasons, the combination of Melzner and Brandes under 35 U.S.C. §103(a) is improper, and it is respectfully requested that the rejection be withdrawn.

CONCLUSION

In view of the foregoing remarks, this application should now be in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes, after this response, that the application is not in condition for allowance, the Examiner is requested to call the undersigned at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Dated: 10/31/07
X10/16/2007

Respectfully submitted,

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